institution, and when our universities are controlled and supported by the state and when there is only one university in a region, it seems to me that the university should administer the libraries, museums, research laboratories and the like, and that the academy of sciences will be essentially a part of the university. The national and local societies for each branch of science are the natural groups for meetings and discussions and for publication. Membership in an academy as an honor, the presidency as a distinction, foreign members, medals, prizes and the like, seem to me to belong to the childhood of science. So long as we are still in this state let us rejoice in our innocence, but what is charming in the child is intolerable in the man.

Has the academy of sciences then played its part in the world? Must it, like the mastodon and elephant, give way to organisms better suited to a changed environment? I have already indicated that I believe the academy to have important if modest functions, and have stated what I think them to be. They are essentially those of a guild. We need a center in each community for organization and social intercourse. As capitalists unite in corporations and laborers in trades unions, so men of science should unite in their academies. We should not profess unselfish philanthropy, but we may reasonably claim that whatever is accomplished to improve the condition of men of science, to increase their influence or to forward their work, is of benefit to the community and for the welfare of society.

J. MCKEEN CATTELL.
COLUMBIA UNIVERSITY.

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*ANNUAL ADDRESS OF THE PRESIDENT OF THE ROYAL SOCIETY.**

PRESIDENT HUGGINS said that since the last anniversary the Society had lost by death nine Fellows and two foreign members. The deceased Fellows were Sir Joseph Gilbert, died December 23, 1901, aged 84; the Marquis of Dufferin and Ava, died February 12, aged 75; Maxwell Simpson, died February 25, aged 86; Sir Richard Temple, died March 15, aged 76; George F. Wilson, died March 28, aged 80; Sir Frederick A. Abel, died September 6, aged 75; Dr. John Hall Gladstone, died October 6, aged 75; William Henry Barlow, died November 12, aged 90; Sir William C. Roberts-Austen, K.C.B., died November 22, aged 59. The foreign members were Alfred Cornu, died April 12, aged 61; Rudolf Virchow, died September 5, aged 80. Not the Royal Society only, but mankind, he said, had sustained grievous loss by the deaths of two of the foreign members. Rudolf Virchow left a record of intellectual achievement unsurpassed in its high distinction and value, its exceptional and sustained vigor during a life unusually prolonged, and its remarkable variety. In his own country Virchow would be remembered not only as the distinguished pioneer in pathological science, but also as an influential politician and a great social and municipal reformer. He had been many times in England. He was present at the Medical Congress held in London in 1881. In the Croonian lecture, delivered before this Society in 1893, he reviewed, in his own masterly way, the progress of pathological physiology. Five years later he gave the Huxley lecture at the Charing-cross Medical School, when he took for his subject 'Recent Advances in Physiology'; Lord Lister and Sir James Paget being present to do him honor. At the celebration of his 80th birthday at Berlin, in 1901, the Royal Society was represented by Lord Lister. Virchow was born in 1821. He was elected a foreign member of the Royal Society in 1884; eight years later the Royal Society conferred upon him their highest

* From the London *Times*.

honor, awarding him the Copley medal. France lost in Alfred Cornu one of the most distinguished of her men of science. Possessed of rare perspicacity of intellect and of resourcefulness in experiment, by his numerous researches, especially in the domain of optics, he had won no mean place as an original contributor to science. On his part, Mme. Cornu wrote in a private letter that he especially appreciated and reciprocated the friendship and sympathy of his English colleagues. Cornu was born in 1841; he was elected a foreign member of this Society in 1884; he received the honorary degree of Doctor of Science from the University of Cambridge in 1899; and died, in the spring of this year, mourned and deeply regretted by the whole scientific world. It was with deep regret that he recorded the loss which the Society had sustained by the decease of Sir Frederick Abel, who held for many years a conspicuous position in the world of science, and in public life, in connection with technical education and the Imperial Institute. His services were recognized by a baronetcy, by K.C.B., and by the G.C.V.O. In 1887 he was awarded a Royal medal by the Council. They had also to record with sorrow the death of Sir Henry Gilbert, the fellow-worker with the late Sir John Bennet Lawes in the famous agricultural experiments carried on for a long series of years by them at Rothamsted. Dr. Gladstone's work was remarkable for its varied nature, and he was among the first to labor in the borderland between chemistry and physics. He was awarded the Davy medal in 1897. He was the first president of the Physical Society, and later president of the Chemical Society, and he served on two Royal Commissions.

After referring to the King's illness and the special sympathy felt by the Society on account of his Majesty's close relationship with them as a former Fellow and now their patron, their deep joy on his recovery, and their satisfaction on the coronation of the King and Queen, the president said that the Prince of Wales, who was elected a Fellow eight years ago, was pleased to attend the ordinary meeting of the Society on February 6 for the purpose of being formally admitted into the Society, introduced by Lord Salisbury, then Prime Minister. On that occasion the Prince said: "I am indeed proud that my name should be added to those on your illustrious roll, which has been inscribed by nearly every sovereign since the reign of Charles II. and by all of the most distinguished men of science since those days. I can assure you of my hearty sympathy with that scientific study and research which now, more than ever, has become so important and essential in our national life." They bade a hearty welcome to the new society which had recently received a royal charter for the organization and promotion of those branches of learning which, in foreign academies, were usually included in the philosophico-historical section. This new body, under its adopted title of 'The British Academy for the Promotion of Historical, Philosophical and Philological Studies,' would, they sincerely trusted, take a worthy place by the side of the older and very distinguished institutions, the Royal Society and the Royal Academy, in representing the intellectual activities of the kingdom, though, in accordance with the sentiments and habits of the national character, each society retained its complete independence, and was in no way subservient to the state. The present council having reaffirmed the view taken by the council of last year, that it would not be desirable to attempt to include the studies undertaken by the newly-formed body as an integral part of the work of the Royal Society, they might rejoice that they would now be cared for by an independent so-

ciety. Though the words of the charter granted by Charles II. were wide enough legally to include historical and philosophical studies, yet, as a matter of fact, with some few exceptions in early days, the work of the Royal Society had been confined for two centuries and a half to the studies with which it was now occupied. It would be their pleasant duty, as the Acting Academy of the International Association of Academies, to recommend the new society for admission into the 'Association of Academies' as the body representing philosophico-historical science in the United Kingdom.

After referring to the National Antarctic Expedition, and the arrival of the *Morning* in New Zealand, which place she was leaving this month in search of the *Discovery,* the president referred to the establishment of a National Physical Laboratory, the opening of which had taken place since the last anniversary. He then described the work of the Physikalisch-technische Reichsanstalt, of Berlin, which was largely due to the scientific foresight of von Helmholtz. The original cost of the institute was over £200,000, and its yearly maintenance was not less than £17,000. During the five years that it had been at work its influence upon the science and the manufacturing interests of Germany had been most remarkable. It was, therefore, with feelings of high satisfaction that he had to record the opening in March last of a similar national institution in this country. The sum voted by the government for the physical laboratory, an institution second to none in its national importance, was the very modest one of £13,000 for the buildings and equipment, and an annual grant of £4,000 for five years in aid of the expenses of conducting the work of the institution. It was, therefore, 'to the liberality of the public,' as the Prince of Wales at the opening pointed out, 'that we must look not only for money, but also for presents of machinery and other appliances.'

The supreme necessity in this country of a more systematic application of scientific methods, both in theory and in practice, to our manufactures and industries, which was so wisely insisted upon by the Prince of Wales on the occasion of his admission to the Fellowship of the Society, and again in his address at the opening of the National Laboratory, had since been confirmed and enforced in a remarkable way by the individual testimonies of thirteen Fellows of this Society in the evidence which they recently gave from their own knowledge and experience, either as teachers of science or as leaders and technical advisers in manufactories or commercial undertakings, before a committee of the London Technical Board. The evidence seemed clear that the present inappreciative attitude of our public men, and of the influential classes of society generally, towards scientific knowledge and methods of thought must be attributed to the too close adherence of our older universities, and through them of our public schools, and all other schools in the country downwards, to the traditional methods of teaching of medieval times. With the experience of Germany and the United States before us, the direction in which we should look for a remedy for this state of things would seem to be for both the teacher and the student to be less shackled by the hampering fetters of examinational restrictions, and so for the professor to have greater freedom as to what he should teach, and the student greater freedom as to what line of study and research he might select as being best suited to his tastes and powers. In the United States the candidate for the highest degree, Ph.D., must spend at least two years, after obtaining his bachelor degree, in carrying out an

investigation in the field of his main object of study, and then submit the dissertation which embodied the results of his research. One way of bringing about reform in this direction would be to make individual research an indispensable condition of proceeding to degrees higher than the B.A. The first steps in the direction of true reform must be taken by the universities in the relaxation to some extent of the established methods and subjects of their examinations, which had been carried down with but little change from the Middle Ages. It was some satisfaction to know that a new section of the British Association for the Advancement of Science had been formed for the consideration and discussion in detail of the reforms which were needed in the educational methods of the country. In the meanwhile much might be done provisionally by their Fellows, in their individual capacity, by stimulating and directing wisely the increased attention which was now being given to science in all departments of life, and especially in fostering and extending the many technical colleges and institutions which were being established in all parts of the country. The fellows would view with no little satisfaction the fact that the King had been pleased to recognize the importance of science being represented on the highest judicial body in the kingdom by the appointment of two of their fellows as privy councillors.

The Copley medal was awarded to Lord Lister in recognition of the value of his physiological and pathological researches in regard to their influence on the modern practice of surgery. When in 1880 a Royal medal was awarded to him, it was acknowledged that his researches had 'not only reformed the whole art of surgery, but given a new impulse to medical science generally.' The experience of another twenty years had written out that judgment in still larger letters. Lister's researches had made the world a wholly different world from what it was before. The Rumford medal was given to the Hon. Charles Algernon Parsons for his success in the application of the steam turbine to industrial purposes, and for its recent extension to navigation. The work of Mr. Parsons was of a kind which specially came under the terms and conditions of the Rumford medal, as consisting 'of new inventions and contrivances by which the generation and preservation and management of heat and of light may be facilitated' and as 'shall tend most to the good of mankind.' By his invention and perfection of the steam turbine he had not only provided a prime mover of exceptional efficiency, working at a high speed without vibration, but had taken a step forward, which made an epoch in the history of the application of steam to industry, and which was probably the greatest since the time of Watt. A Royal medal was awarded to Professor Horace Lamb for his investigations in mathematical physics. Professor Lamb had been conspicuous during the last twenty years by the extent and value of his contributions to mathematical physics. His writings had been distinguished by clearness, precision, and perfection of form. The other Royal medal was conferred upon Professor Edward Albert Schäfer for his researches into the functions and minute structure of the central nervous system, especially with regard to the motor and sensory functions of the cortex of the brain. The Davy medal was awarded to Professor Svante August Arrhenius for his application of the theory of dissociation to the explanation of chemical change. It was not easy to over-estimate the importance of the service rendered to chemistry by Professor Svante Arrhenius through the publication of his memoir, presented to the Swedish

Academy of Sciences on June 6, 1883, entitled 'Recherches sur la Conductibilité Galvanique des Electrolytes.' The Darwin medal was conferred upon Mr. Francis Galton, F.R.S., for his numerous contributions to the exact study of heredity and variation contained in 'Hereditary Genius,' 'Natural Inheritance,' and other writings. The work of Mr. Galton had long occupied a unique position in evolutionary studies. His treatise on 'Hereditary Genius' (1869) was not only what it claimed to be, the first attempt to investigate the special subject of the inheritance of human faculty in a statistical manner and to arrive at numerical results, but in it exact methods were, for the first time, applied to the general problem of heredity on a comprehensive scale. It might safely be declared that no one living had contributed more definitely to the progress of evolutionary study, whether by actual discovery or by the fruitful direction of thought, than Mr. Galton. The Buchanan medal, awarded every five years for distinguished services to hygienic science or practice, was given to Dr. Sydney A. Monckton Copeman for his experimental investigations into the bacteriology and comparative pathology of vaccination. The Hughes medal was awarded to Professor Joseph John Thomson in recognition of his contributions to the advancement of electrical science, especially in connection with the phenomena of electric discharge through rarefied gases. By virtue of Professor Thomson's own investigations, and of many others inspired and stimulated by him, this new field of knowledge had been widely extended, and it could hardly be doubted that the progress of this new department of knowledge would gradually enable us to see one whole stage deeper into the sources of physical phenomena.

THE CARNEGIE INSTITUTION.

RULES OF THE CARNEGIE INSTITUTION RELATIVE TO GRANTS FOR RESEARCH.

Adopted Nov. 26, 1902.*

(1) Applications for grants may be made at any time and should be addressed to the CARNEGIE INSTITUTION, WASHINGTON, D. C.

(2) The Executive Committee will carefully consider each application and decide upon it, but will not assign reasons for declining in cases where grants are deemed inexpedient.

(3) When a grant is made the applicant will be promptly notified to that effect.

(4) When a grant is declined the applicant will be promptly notified to that effect.

(5) An account of all expenditures, accompanied by detailed vouchers, must be rendered by the recipient from time to time as payments are made, and a complete statement at the conclusion of the investigation.

(6) All apparatus, books, and materials purchased with and all collections made by means of grants from the Carnegie Institution are the property of the Institution, are subject to its disposition, and are to be accounted for.

(7) A grant made for a specified purpose can be used for that purpose only. If the recipient desires to change in any manner the subject of his investigation, he should make an application, in the usual form, for a new grant.

(8) Any part of an appropriation not needed for completing the investigation for which the grant was made shall be returned to the Institution.

(9) Payments of grants will, in general, be made quarterly, but in special cases may be made more frequently.

*** These rules appear on back of Application printed on opposite page.**